

WE CLAIM:

1. An absorbent composition comprising:
a superabsorbent material having a plurality of permanent crosslinking points and a plurality of transitional crosslinking points, the superabsorbent material exhibiting a free swell absorbency of at least 15 g/g and an Absorbency Change of at least 15% upon saturation.
2. The absorbent composition of Claim 1, wherein the superabsorbent material exhibits an Absorbency Change of at least 20% upon saturation.
3. The absorbent composition of Claim 1, wherein the superabsorbent material exhibits an Absorbency Change of at least 30% upon saturation.
4. The absorbent composition of Claim 1, wherein the superabsorbent material exhibits a free swell absorbency of at least 20 grams/gram.
5. The absorbent composition of Claim 1, wherein the superabsorbent material exhibits a free swell absorbency of at least 25 grams/gram.

BEST AVAILABLE COPY

BEST AVAILABLE COPY

6. The absorbent composition of Claim 1, wherein the superabsorbent material has an absorbency under load value of at least 10 grams/gram.
7. The absorbent composition of Claim 1, wherein the superabsorbent material has an absorbency under load value of at least 15 grams/gram.
8. The absorbent composition of Claim 1, wherein the superabsorbent material has an absorbency under load value of at least 20 grams/gram.
9. The absorbent composition of Claim 1, wherein the plurality of transitional crosslinking points are pre-existing in the superabsorbent material and undergo a disassociation process upon saturation.
10. The absorbent composition of Claim 9, wherein the plurality of transitional crosslinking points comprises weak bonds.
11. The absorbent composition of Claim 9, wherein the plurality of transitional crosslinking points comprises hydrolysable bonds.

BEST AVAILABLE COPIE

12. The absorbent composition of Claim 9, wherein the plurality of transitional crosslinking points comprises triggering disassociation bonds.
13. The absorbent composition of Claim 9, wherein the plurality of transitional crosslinking points comprises a plurality of ionic bonds that are disassociated by a removing agent.
14. The absorbent composition of Claim 13, wherein the ionic bonds are formed by metal ions having at least three positive charges.
15. The absorbent composition of Claim 13, wherein the removing agent comprises a chelating agent.
16. The absorbent composition of Claim 15, wherein the chelating agent comprises sodium phosphate.
17. The absorbent composition of Claim 1, wherein the plurality of transitional crosslinking points are newly established upon use subsequent to saturation of the superabsorbent material.

BEST AVAILABLE COPY

18. The absorbent composition of Claim 17, wherein the plurality of transitional crosslinking points comprises a plurality of in-situ reactive agents that can be mixed with polyacrylate superabsorbent material in a dry state and in-situ form transitional crosslinking points upon saturation.

19. The absorbent composition of Claim 18, wherein the plurality of in-situ reactive agents comprise a dry powder selected from the group consisting of metallic oxides, hydroxides, salts, and combinations thereof.

20. The absorbent composition of Claim 18, wherein the plurality of in-situ reactive agents comprise a dry powder selected from the group consisting of aluminum oxide, zirconium oxide, aluminum hydroxide, aluminum chloride, ammonium zirconium carbonate, aluminum sulfate, ceric ammonium sulfate, and combinations thereof.

21. The absorbent composition of Claim 17, wherein the plurality of transitional crosslinking points comprises triggering forming bonds.

22. The absorbent composition of Claim 1, wherein the absorbent composition can be integrated with a component of an absorbent article using a method selected from the group consisting of blending, printing, coating, and encapsulating.

BEST AVAILABLE COPY

23. The absorbent composition of Claim 1, wherein the superabsorbent material and the plurality of transitional crosslinking points are homogeneously incorporated into the absorbent composition.

24. The absorbent composition of Claim 1, wherein the superabsorbent material and the plurality of transitional crosslinking points are non-homogeneously incorporated into the absorbent composition.

25. The absorbent composition of Claim 1, wherein the superabsorbent material comprises an acidic, water-swellable, water insoluble polymer having at least about 50 molar percent of its acidic functional groups in free acid form, and a basic neutralization agent.

26. The absorbent composition of Claim 1, wherein the superabsorbent material comprises a basic, water-swellable, water insoluble polymer having at least about 50 molar percent of its basic functional groups in free base form, and an acidic neutralization agent.

27. The absorbent composition of Claim 26, wherein the plurality of permanent crosslinking points are formed by a polyanionic crosslinking agent.

BEST AVAILABLE COPY

28. The absorbent composition of Claim 1, wherein the superabsorbent material comprises an acidic, water-swellable, water-insoluble polymer having at least about 50 molar percent of its acidic functional groups in free acid form; and a basic, water-swellable, water-insoluble polymer having at least about 50 molar percent of its basic functional groups in free base form.

29. The absorbent composition of Claim 1, wherein the plurality of permanent crosslinking points are formed by a polymerizable crosslinking agent.

30. The absorbent composition of Claim 29, wherein the polymerizable crosslinking agent comprises methylene bisacrylamide.

31. The absorbent composition of Claim 1, wherein the plurality of permanent crosslinking points are formed by a reactive crosslinking agent selected from the group consisting of dialdehydes and diepoxides.

32. The absorbent composition of Claim 31, wherein the reactive crosslinking agent is selected from the group consisting of glutaraldehyde and polyethylene glycol diglycidyl ether.

33. The absorbent composition of Claim 1, wherein the plurality of permanent crosslinking points are formed by a latent crosslinking agent.

34. The absorbent composition of Claim 33, wherein the latent crosslinking agent comprises an organic compound having at least two functionalities capable of reacting with at least one functional group selected from the group consisting of carboxyl, carboxylic acid, amino, and hydroxyl groups.

35. The absorbent composition of Claim 34, wherein the latent crosslinking agent comprises an organic compound selected from the group consisting of diamines, polyamines, diols, polyols, polycarboxylic acids, and polyoxides.

36. The absorbent composition of Claim 1, wherein the plurality of permanent crosslinking points are formed by a crosslinking agent having a metal ion with more than two positive charges.

37. The absorbent composition of Claim 36, wherein the metal ion in the crosslinking agent is selected from the group consisting of Al^{3+} , Fe^{3+} , Ce^{3+} , Ce^{4+} , Ti^{4+} , Zr^{4+} , and Cr^{3+} .

BEST AVAILABLE COPY

38. The absorbent composition of Claim 1, wherein the permanent crosslinking points and the transitional crosslinking points are present in the superabsorbent material in a ratio of between 1:9 and 9:1.

39. The absorbent composition of Claim 1, wherein the permanent crosslinking points and the transitional crosslinking points are present in the superabsorbent material in a ratio of between 2:8 and 8:2.

40. The absorbent composition of Claim 1, wherein the permanent crosslinking points and the transitional crosslinking points are present in the superabsorbent material in a ratio of between 3:7 and 7:3.

41. An absorbent garment comprising the absorbent composition of Claim 1.

42. The absorbent garment of Claim 41, wherein a density of the permanent crosslinking points and the transitional crosslinking points varies throughout the absorbent composition.

BEST AVAILABLE COPY

BEST AVAILABLE COPY

43. An absorbent composition comprising:

an acidic, water-swellable, water insoluble polymer having at least about 50 molar percent of its acidic functional groups in free acid form; and

a basic neutralization agent;

wherein the absorbent composition exhibits a free swell absorbency of at least 15 g/g and an Absorbency Change of greater than or equal to 15% upon saturation.

44. The absorbent composition of Claim 43, wherein the acidic, water-swellable, water insoluble polymer comprises at least one functional group selected from the group consisting of carboxyl groups, sulfonic groups, sulphate groups, sulfite groups, and phosphate groups.

45. The absorbent composition of Claim 44, wherein the at least one functional group is attached to a crosslinked base polymer.

46. The absorbent composition of Claim 45, wherein the crosslinked base polymer is selected from the group consisting of polyacrylates, polyacrylamides, polyvinyl alcohols, ethylene maleic anhydride copolymer, polyvinyl ethers, polyacrylamido methylpropane sulfonic acid, polyacrylic acids, polyvinylpyrrolidones, polyvinyl morpholines, and copolymers thereof.

BEST AVAILABLE COPY

47. The absorbent composition of Claim 43, wherein the acidic, water-swellable, water insoluble polymer comprises a natural based polysaccharide polymer selected from the group consisting of carboxymethyl celluloses, carboxymethyl starches, acrylic grafted celluloses, hydrolyzed starch grafted polyacrylonitriles, and copolymers thereof.

48. The absorbent composition of Claim 43, wherein the acidic, water-swellable, water insoluble polymer comprises a synthetic polypeptide selected from the group consisting of polyaspartic acid and polyglutamic acid.

49. The absorbent composition of Claim 43, wherein the basic neutralization agent comprises a polymeric basic material selected from the group consisting of polyamines, polyimines, polyamides, polyquaternary ammoniums, chitins, chitosans, polyasparagins, polyglutamines, polylysines, and polyarginines.

50. The absorbent composition of Claim 43, wherein the basic neutralization agent comprises an organic basic material selected from the group consisting of organic salts, aliphatic amines, aromatic amines, imines, and amides.

BEST AVAILABLE COPY

51. The absorbent composition of Claim 43, wherein the basic neutralization agent comprises an inorganic basic material selected from the group consisting of metallic oxides, hydroxides, salts, and combinations thereof.

52. The absorbent composition of Claim 43, wherein the acidic, water-swellable, water insoluble polymer has at least about 70 molar percent of its acidic functional groups in free acid form.

53. The absorbent composition of Claim 43, wherein the acidic, water-swellable, water insoluble polymer has at least about 90 molar percent of its acidic functional groups in free acid form.

54. The absorbent composition of Claim 43, wherein the acidic, water-swellable, water insoluble polymer has about 100 molar percent of its acidic functional groups in free acid form.

BEST AVAILABLE COPY

55. An absorbent composition comprising:
a basic, water-swellable, water insoluble polymer having at least
about 50 molar percent of its basic functional groups in free base form; and
an acidic neutralization agent;
wherein the absorbent composition exhibits a free swell
absorbency of at least 15 g/g and an Absorbency Change of greater than or
equal to 15% upon saturation.

56. The absorbent composition of Claim 55, wherein the
basic, water-swellable, water insoluble polymer comprises at least one
functional group selected from the group consisting of quaternary ammonium
groups, primary amino groups, secondary amino groups, tertiary amino groups,
imino groups, imido groups, and amido groups.

57. The absorbent composition of Claim 56, wherein the at
least one functional group is attached to a crosslinked base polymer.

58. The absorbent composition of Claim 57, wherein the
crosslinked base polymer is selected from the group consisting of polyamines,
polyethylenimines, polyacrylamides, polyvinylamines, polydiallyl dimethyl
ammonium hydroxide, polyquaternary ammoniums, and copolymers thereof.

BEST AVAILABLE COPY

59. The absorbent composition of Claim 55, wherein the basic, water-swellable, water insoluble polymer comprises a natural based polysaccharide polymer selected from the group consisting of chitin and chitosan.

60. The absorbent composition of Claim 55, wherein the basic, water-swellable, water insoluble polymer comprises a synthetic polypeptide selected from the group consisting of polyasparagins, polyglutamines, polylysines, and polyarginines.

61. The absorbent composition of Claim 55, wherein the acidic neutralization agent comprises a polymeric acidic material selected from the group consisting of polyacrylic acid, polymaleic acid, carboxymethyl cellulose, alginic acid, polyaspartic acid, and polyglutamic acid.

62. The absorbent composition of Claim 55, wherein the acidic neutralization agent comprises an organic acidic material selected from the group consisting of aliphatic acids and aromatic acids.

63. The absorbent composition of Claim 55, wherein the acidic neutralization agent comprises an organic acidic material selected from the group consisting of citric acid, glutamic acid, and aspartic acid.

64. The absorbent composition of Claim 55, wherein the acidic neutralization agent comprises an inorganic acidic material selected from the group consisting of metallic oxides, salts, and combinations thereof.

65. The absorbent composition of Claim 55, wherein the acidic neutralization agent comprises an inorganic acidic salt selected from the group consisting of iron chloride, calcium chloride, zinc chloride, and combinations thereof.

66. The absorbent composition of Claim 55, wherein the basic, water-swellable, water insoluble polymer has at least about 70 molar percent of its basic functional groups in free base form.

67. The absorbent composition of Claim 55, wherein the basic, water-swellable, water insoluble polymer has at least about 90 molar percent of its basic functional groups in free base form.

68. The absorbent composition of Claim 55, wherein the basic, water-swellable, water insoluble polymer has about 100 molar percent of its basic functional groups in free base form.

BEST AVAILABLE COPY